

Claims

1. A method for measuring the optical parameters of a phase object, comprising recording a moiré pattern viewed through said phase object, said moiré pattern being formed by illuminating by means of a source of diffuse light, first and second gratings positioned in the space between said light source and said phase object, wherein the plane of said first grating is parallel to the plane of said second grating, and calculating the optical parameters of interest from said moiré pattern.

2. A method according to claim 1, wherein the first and second gratings are provided in the form of first and second grids, respectively, wherein each grid is obtained by overlapping two identical sets of equidistant parallel lines at an angle of 90°.

3. A method according to claim 2, wherein the periodicity of the sets of equidistant parallel lines forming the first grid is different from the periodicity of the sets of equidistant parallel lines forming the second grid.

4. A method according to claim 1, wherein the gratings are illuminated by light that has been filtered, such that the light transmitted through the filter has a wavelength distribution in the form of a narrow band centered on a preselected wavelength λ , and the two gratings are separated from each other by a distance d , given by $d = n \cdot p_1 p_2 / \lambda$ ($n = 1, 2, 3, \dots$), wherein p_1 and p_2 indicate the periodicity of the first and second gratings, respectively.

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5. A method according claim 1, wherein the recording of the moiré pattern is effected by means of a camera focused at a plane between the gratings.

6. A method according to claim 5, wherein the camera is located at a predetermined distance from said gratings, such that, in the absence of the object to be tested, a desired reference moiré pattern consisting of horizontal and vertical fringes is captured by said camera.

7. A method according to any one of claims 1 to 6, wherein the calculation of the optical parameter of interest comprises transforming the recorded moiré pattern into one or more points in the spatial frequency plane, such that the vectors defining said points are the vectors of spatial frequencies \mathbf{v}_y and \mathbf{v}_x associated with said moiré pattern, identifying the components of said vectors (v_{yx} , v_{yy}) and (v_{xx} , v_{xy}) and substituting their values in an equation which linearly relates said optical parameter of interest to the second order derivatives $\frac{\partial^2 D}{\partial x^2}$, $\frac{\partial^2 D}{\partial x \partial y}$, $\frac{\partial^2 D}{\partial y \partial x}$, $\frac{\partial^2 D}{\partial y^2}$, respectively, wherein D is the wavefront of the beam exiting the phase object.

8. A method according to claim 7, wherein the calculation of the optical parameter of interest is effected using an equation that linearly relates said optical parameter of interest to the second order derivatives $\frac{\partial^2 D}{\partial x^2}$, $\frac{\partial^2 D}{\partial x \partial y}$, $\frac{\partial^2 D}{\partial y \partial x}$,

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$\frac{\partial^2 D}{\partial y^2}$, wherein D is the wavefront of the beam exiting the phase object, wherein the coefficient of proportionality k in said linear equation is given by $k = p_i/d$, wherein d is the distance between the two gratings and p_i is related to the periodicity of said gratings and to the distances between said gratings and the camera used to record the moiré pattern.

9. A method according to any one of claims 1 to 8, wherein the measured optical parameter of the phase object under test is position-dependent, and the values of said optical parameter are represented by a contour map corresponding to the surface of said object.

10. An apparatus for determining the optical parameters of a phase object, comprising:

A source for producing diffuse light;
First and second gratings capable of producing a moiré pattern, wherein said gratings are placed in the space between said light source and the position intended for said phase object, and the plane of said first grating is parallel to the plane of said second grating; and
Means for recording the moiré pattern viewed through said phase object.

11. An apparatus according to claim 10, wherein the first and second gratings have different periodicities.

12. An apparatus according to claims 10 and 11, wherein the first and second gratings are provided in the form of first

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and second grids, respectively, wherein each grid is obtained by overlapping two identical sets of equidistant parallel lines at an angle of 90°.

13. An apparatus according to claim 10, wherein the gratings are angularly oriented with respect to each other.

14. An apparatus according to claim 10, further comprising a transparent support for placing the tested phase object thereon.

15. An apparatus according to claim 10, further comprising filter means coupled to the source of diffuse light, to allow the transmission of a preselected wavelength λ .

16. An apparatus according to claim 15, wherein the two gratings are separated from each other by a distance d , given by $d = n \cdot p_1 p_2 / \lambda$ ($n = 1, 2, 3, \dots$), wherein p_1 and p_2 indicate the periodicity of the first and second gratings, respectively.

17. An apparatus according to claim 10, further comprising means positioned between the light source and the first grating, for uniformly projecting the diffuse light into the space between said light source and the phase object.

18. An apparatus according to claim 10, wherein the means for recording the moiré pattern includes a camera positioned at a predetermined distance from the gratings.

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